

SITE: TVA Kingston  
BREAK: 2.2  
OTHER: \_\_\_\_\_

## Ash Sampling Results

The ash from the Kingston ash pond and dredge cells has been regularly tested for naturally occurring metals since the Kingston dike failure occurred on December 22, 2008. Coal, in its natural state, contains various trace metals that can be concentrated and retained in the ash after burning the coal for power production. Coal ash is used in many products encountered on a daily basis, such as the basic ingredient of most concrete, mortar, stucco, and most non-specialty grouts in the world.

The following graphs represent a visual summary of the levels of metals found in 47 ash samples that were collected and submitted for laboratory analysis since the December 22 release. Each page represents the results of all ash samples tested for that metal; for example the first page is a summary of arsenic levels, the second is a summary of beryllium levels and so on to the last page which is a summary of the levels of zinc found in the 47 ash samples.

For each graph, along the bottom on the horizontal axis, the symbols "AF", "GP" and "S" represent discrete sample names that correlate with the locations on the map provided. "AF" stands for samples from the "ash flow area" or released ash, the "S" samples, S-1, S-2 etc. were composite samples taken from the surface of the undisturbed cell area, and the "GP" series were vertical cores of the undisturbed cell taken with a "Geoprobe®" device down to a depth of 60 feet below the surface.

The values on the left-side vertical axis represent the laboratory reported concentration in mg/kg, which is an expression of the metals concentration.

Although ash is not soil, comparing metal concentrations of the ash to published background levels of soils puts the values observed in ash in a common perspective. The black line drawn across various heights on each graph indicates the established concentration of that metal in typical Kingston background soils. The larger blue shaded area indicates the range of concentrations for that metal in typical Tennessee background soils.

The Kingston background soil levels for the various elements differ from the range of concentrations for Tennessee soils because of the underlying geology specific to the Emory River basin. As can be readily seen, the trace elements vary widely in the surface soils of the state.

### Results:

Most results demonstrate that the total concentrations of metals in the ash are generally below or near the concentration in local background soils. While some results show metal concentrations higher than local background soils, they are well within the background levels observed in Tennessee soils.

Two exceptions are noted. The measured concentrations of thallium in the ash for two samples are slightly higher than the range found in Tennessee. One of the two samples, AFA18, was taken from the very edge of the ash area and was observed to contain some river sediment at the time of sampling.

Also, the Tennessee background soil range for beryllium (0.5 to 1.0 mg/kg) is less than the established background level for the local area (2.2 mg/kg). Although this appears odd, another reference states a range of 1.5 to 15.0 mg/kg from the nearby Citico Creek Wilderness Area in Monroe County, Tennessee. Based on this additional reference, the beryllium concentrations observed in the TVA ash (which do not exceed 4.5 mg/kg) are consistent with background levels of beryllium in local soil. **Note:** Milligrams per kilogram (mg/kg) is often referred to as parts per million (ppm).

The levels of arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, vanadium, and zinc in the majority of TVA ash samples were found to be within the range for soils found throughout the State of Tennessee.

For decades, much effort has been spent nationwide to determine the concentrations of various trace elements in coal ash. It has been found that the levels of the various elements are highly dependent on the source of the coal that was burned and that the levels can be highly variable. The values presented here are not surprising nor out of expected ranges when compared to that nationwide body of information. Furthermore, other governmental bodies have also sampled the TVA ash and have found similar results to those presented here on their analyses.

TVA remains in contact with other governmental bodies to perform inter-agency comparisons of data and to ensure that potential public health hazards and environmental hazards are constantly being assessed.



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### Legend

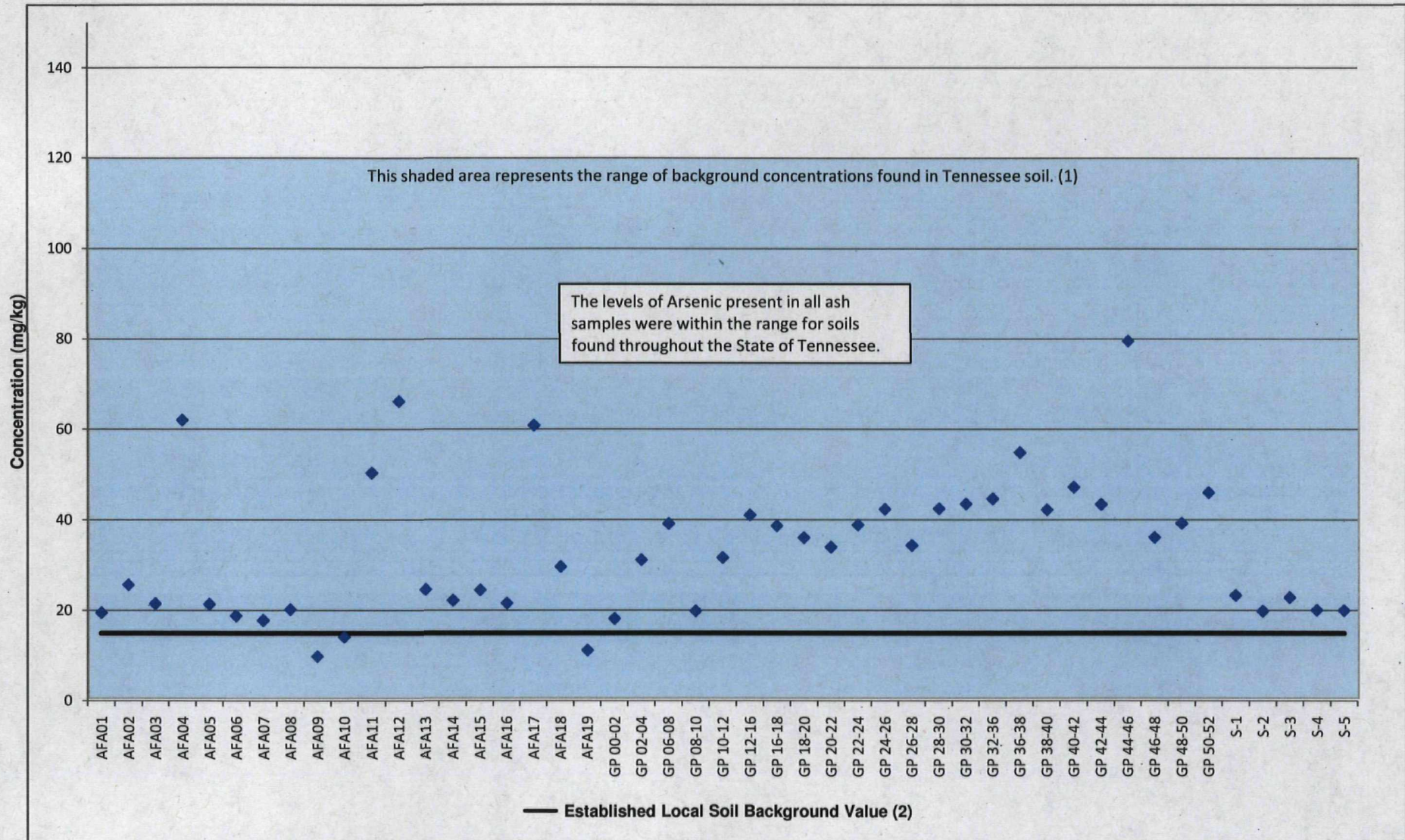
- ▲ Ash Sample Locations
- + River Miles

River Mile Codes  
 CRM = Clinch River mile  
 ERM = Emory River mile  
 TRM = Tennessee River mile

Map Imagery from 12/30/2008  
 Map Compiled: 02/24/2009

OE&R - ER&S  
 Geographic Information & Engineering

## Arsenic, Total TVA Kingston Ash Spill

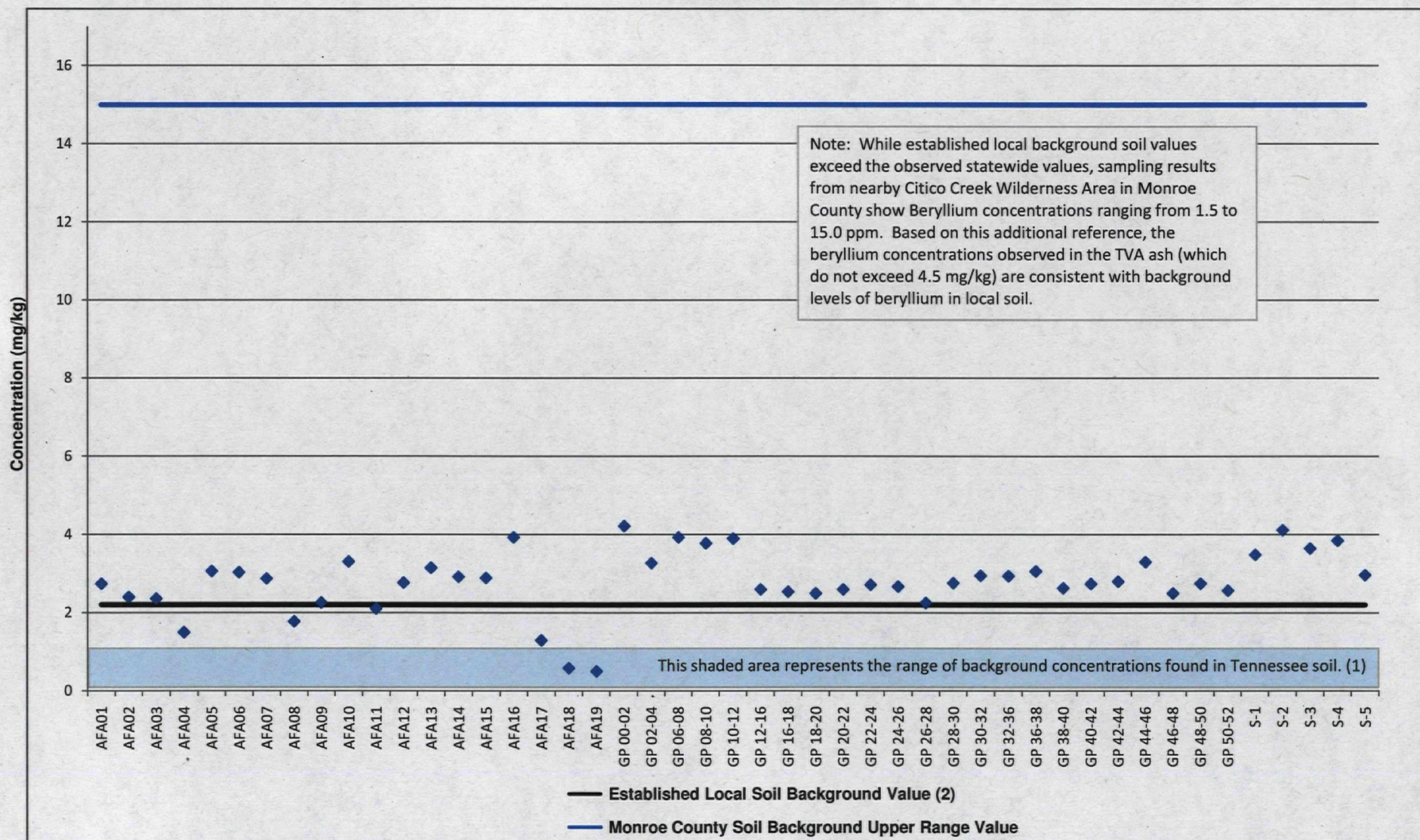


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - The Local Established Background Soil Value for Arsenic is 14.95 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Beryllium, Total TVA Kingston Ash Spill

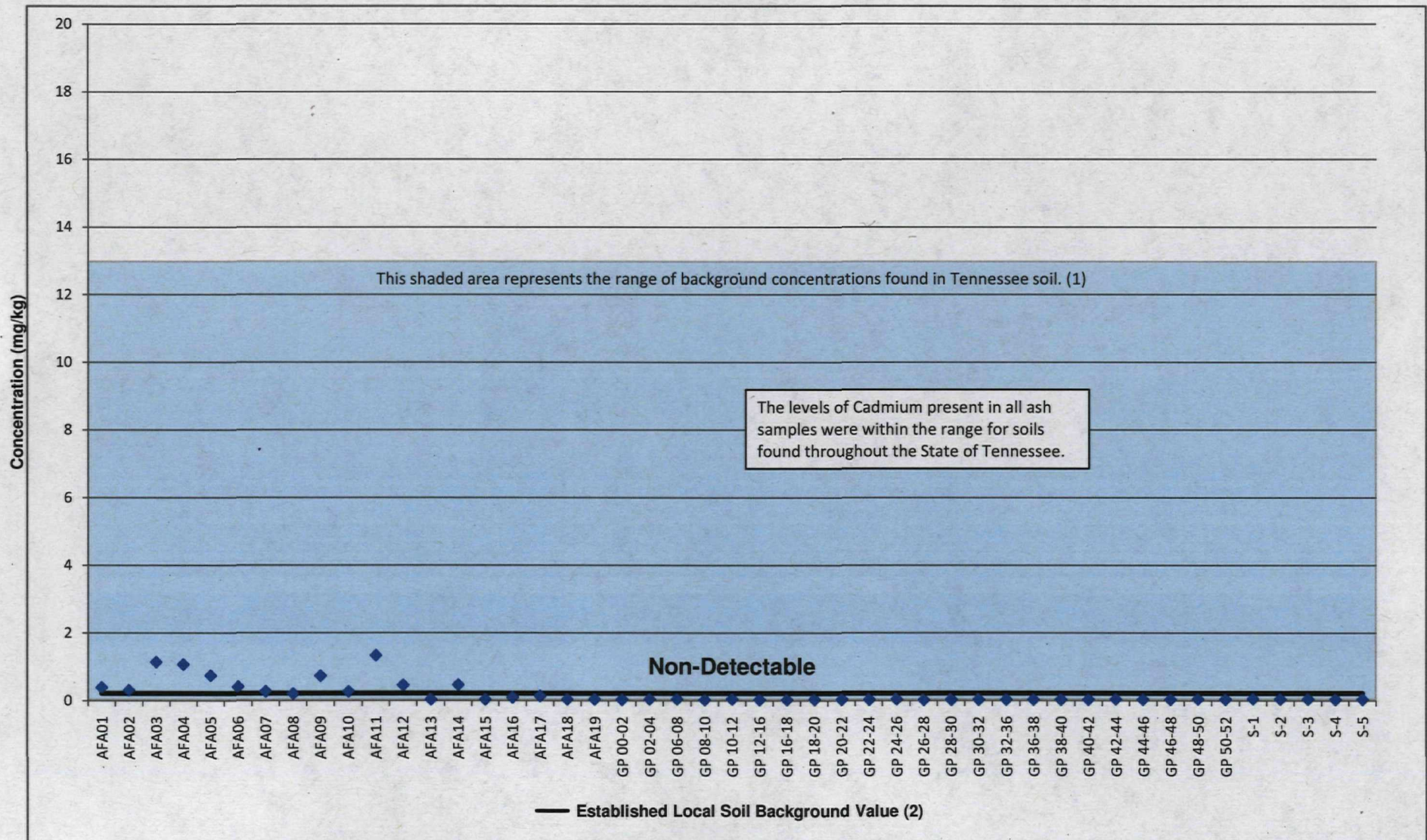


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - The Local Established Background Soil Value for Beryllium is 2.2 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Cadmium, Total TVA Kingston Ash Spill

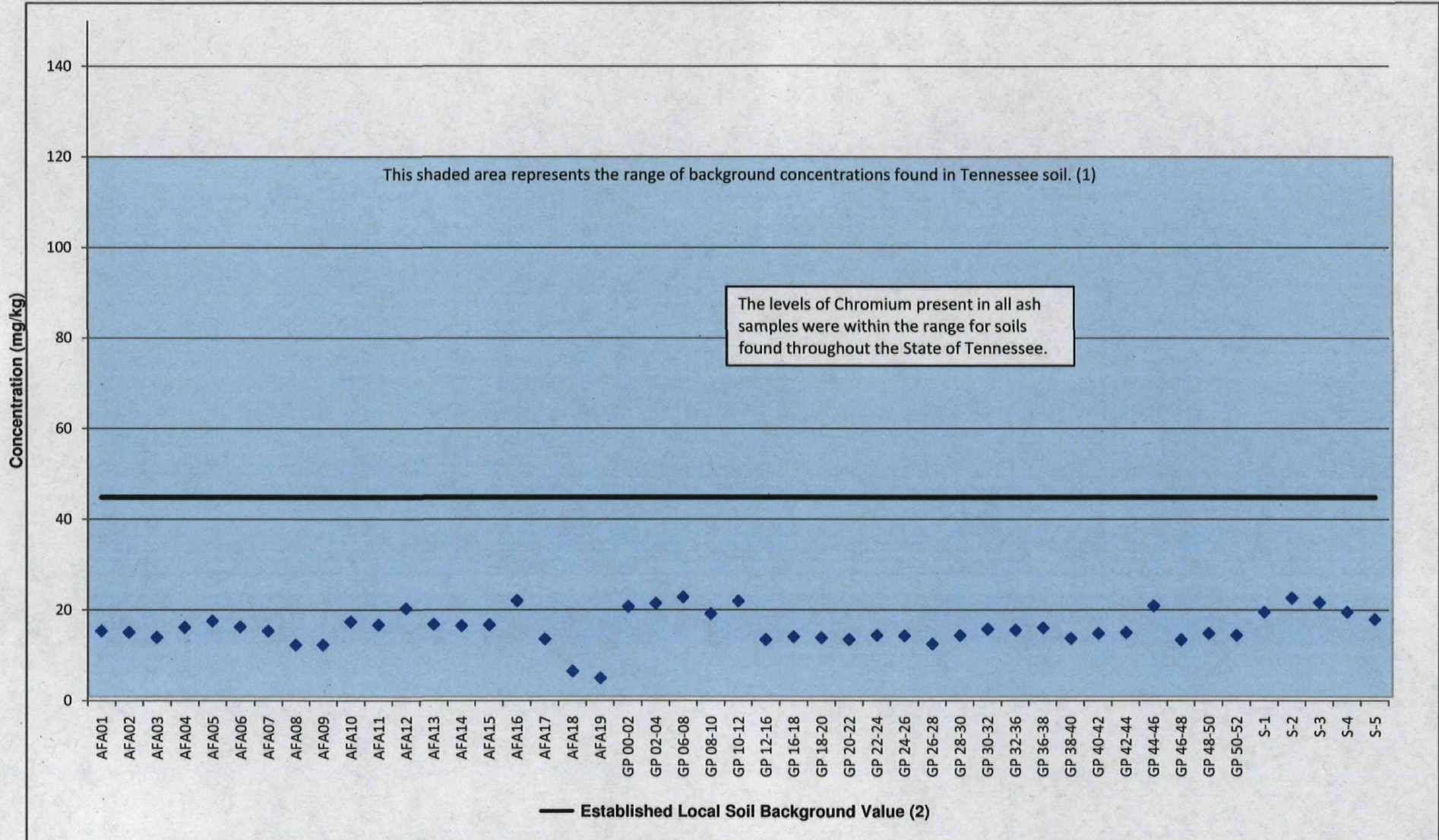


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - Cadmium was not detected in local soil at concentrations above the reporting limit of 0.22 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Chromium, Total TVA Kingston Ash Spill

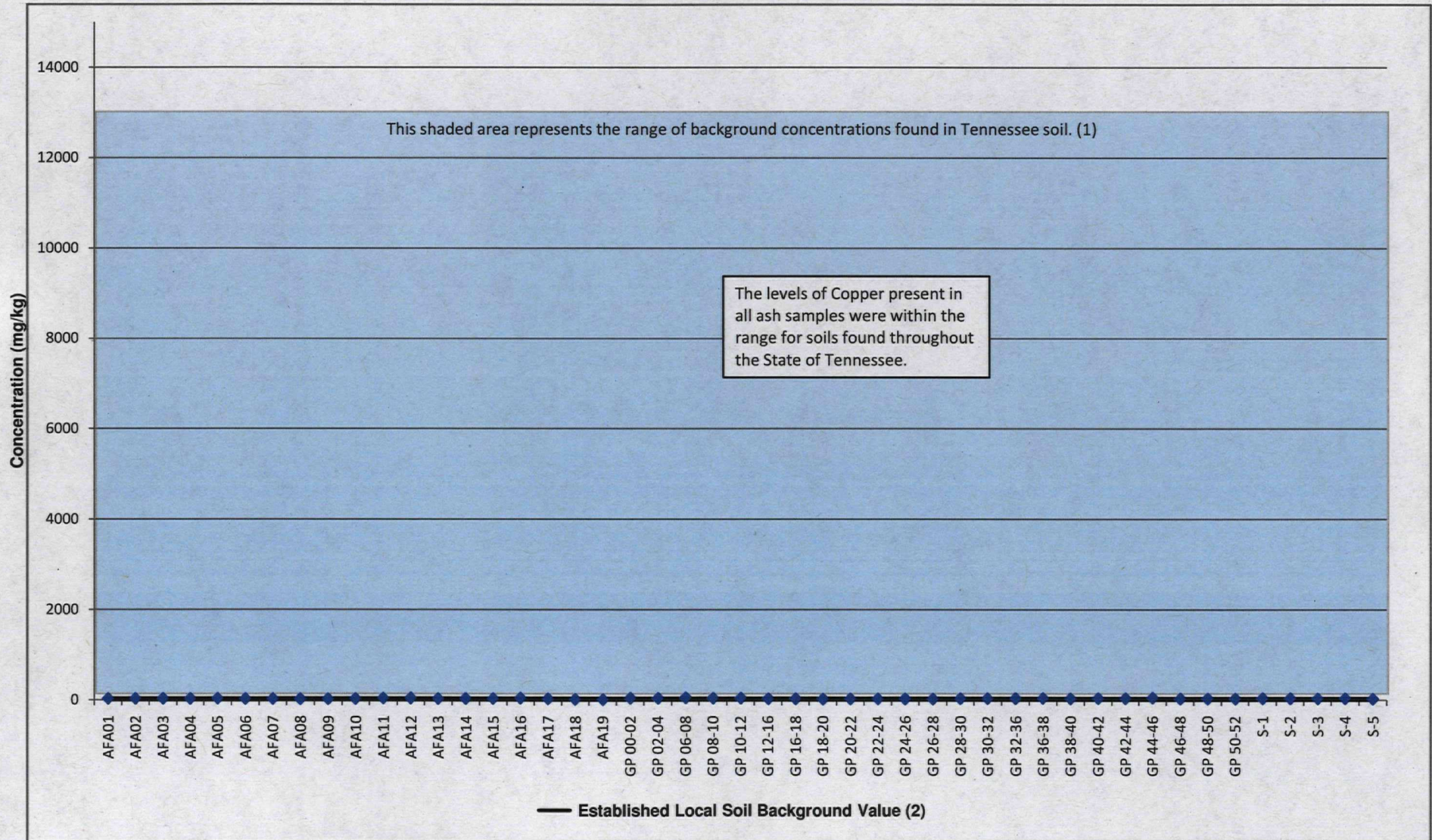


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - The Local Established Background Soil Value for Chromium is 44.88 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Copper, Total TVA Kingston Ash Spill

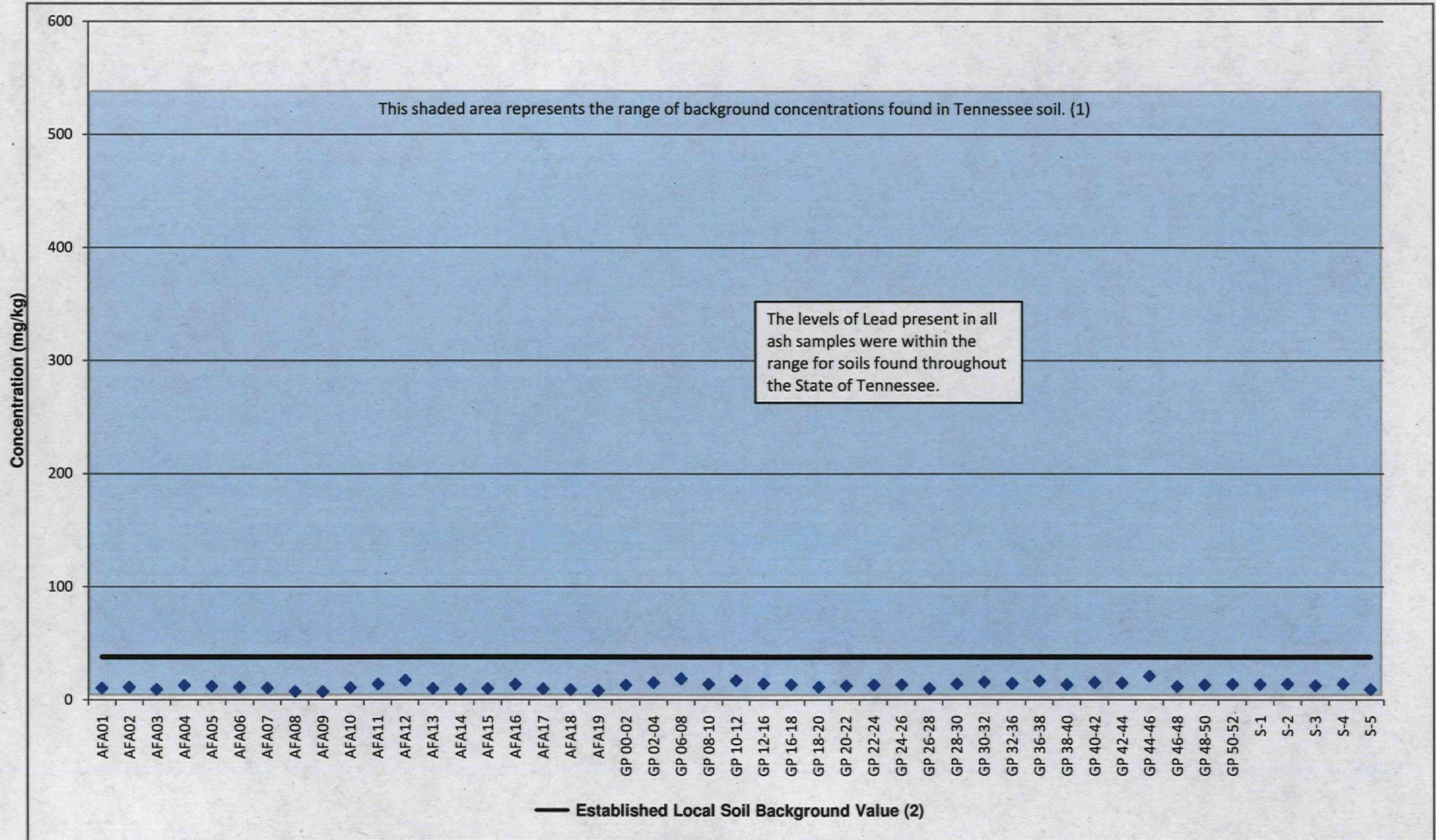


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - The Local Established Background Soil Value for Copper is 22.48 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Lead, Total TVA Kingston Ash Spill

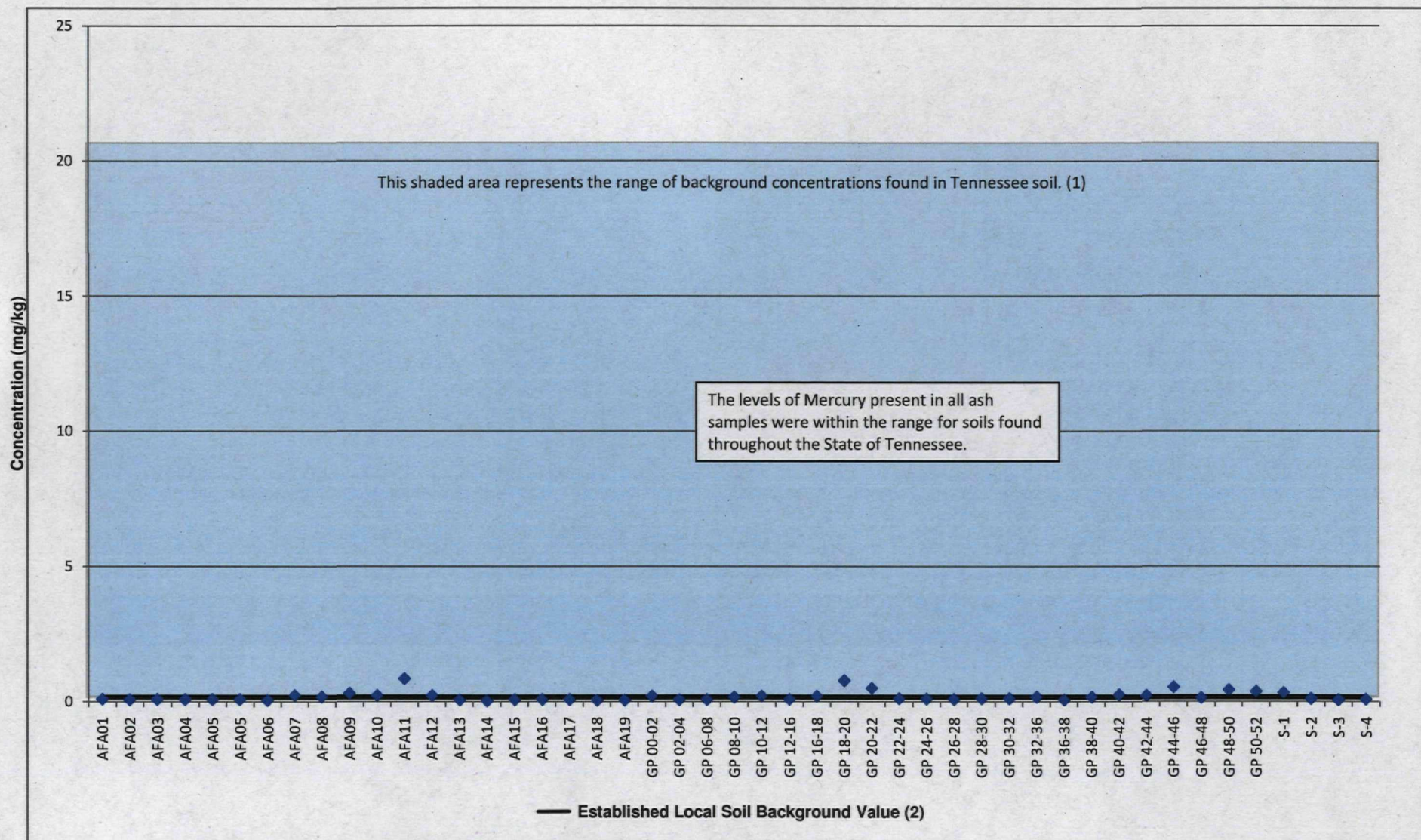


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - The Local Established Background Soil Value for Lead is 37.91 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Mercury, Total TVA Kingston Ash Spill

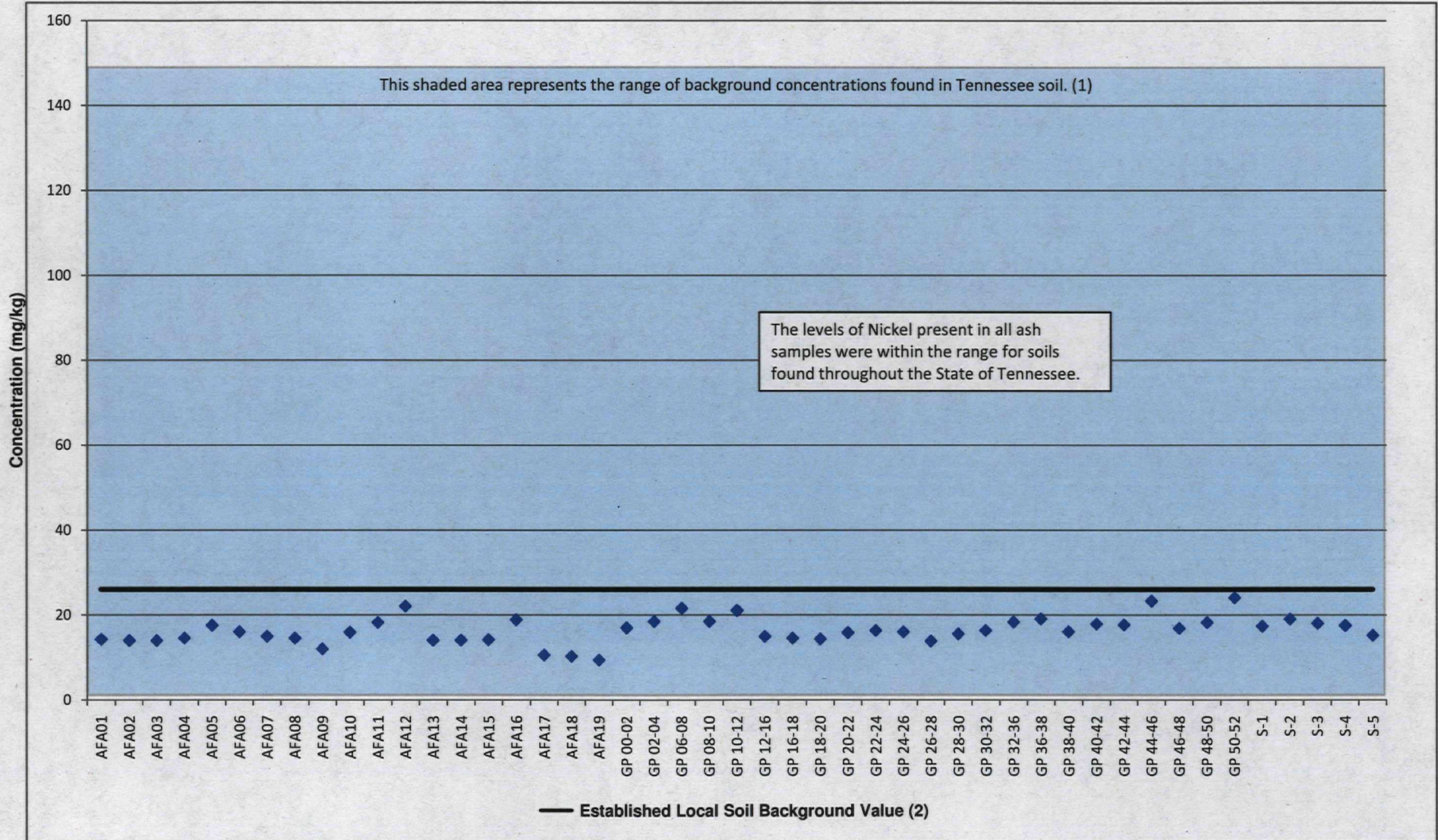


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - The Local Established Background Soil Value for Mercury is 0.17 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Nickel, Total TVA Kingston Ash Spill

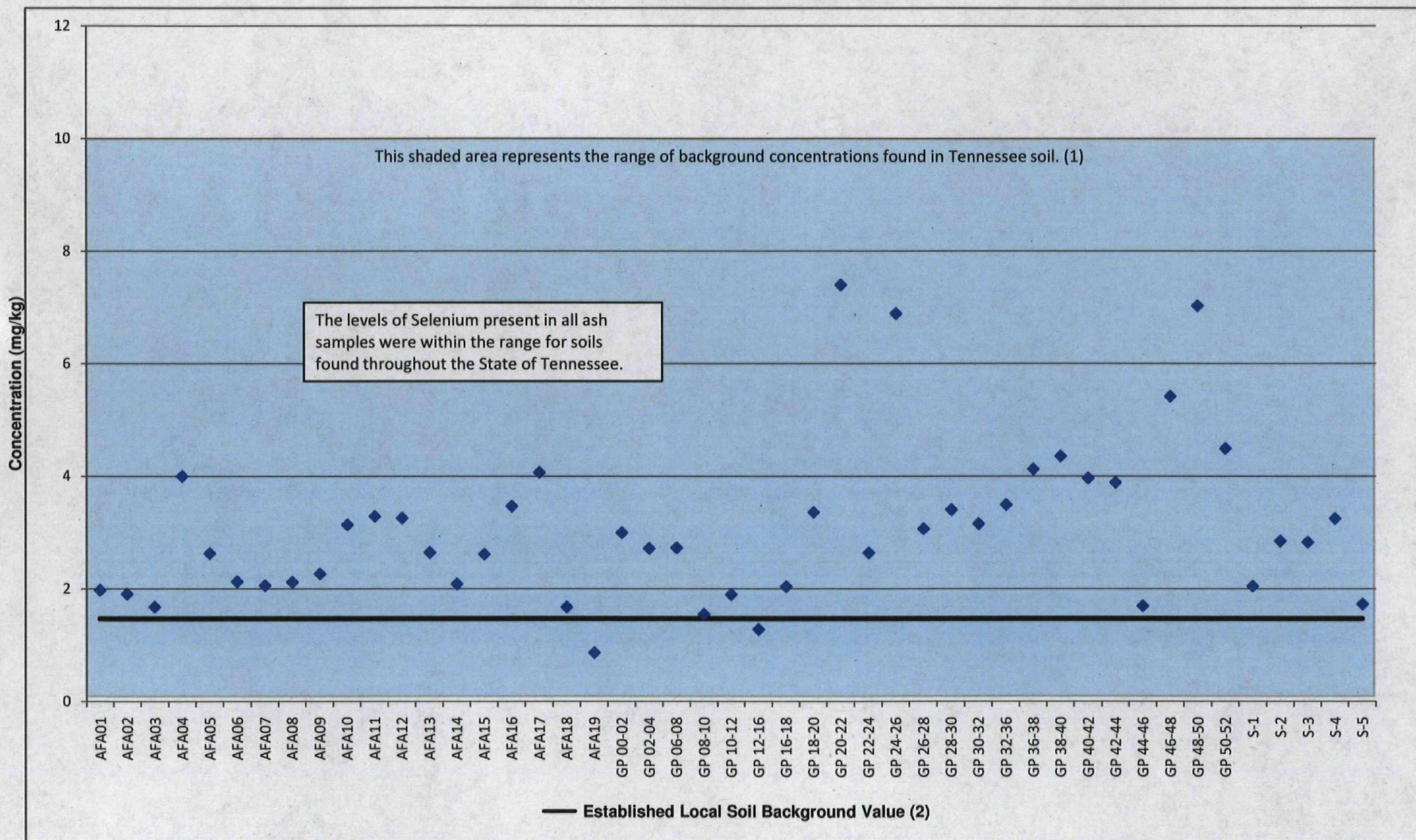


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - The Local Established Background Soil Value for Nickel is 26.07 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Selenium, Total TVA Kingston Ash Spill

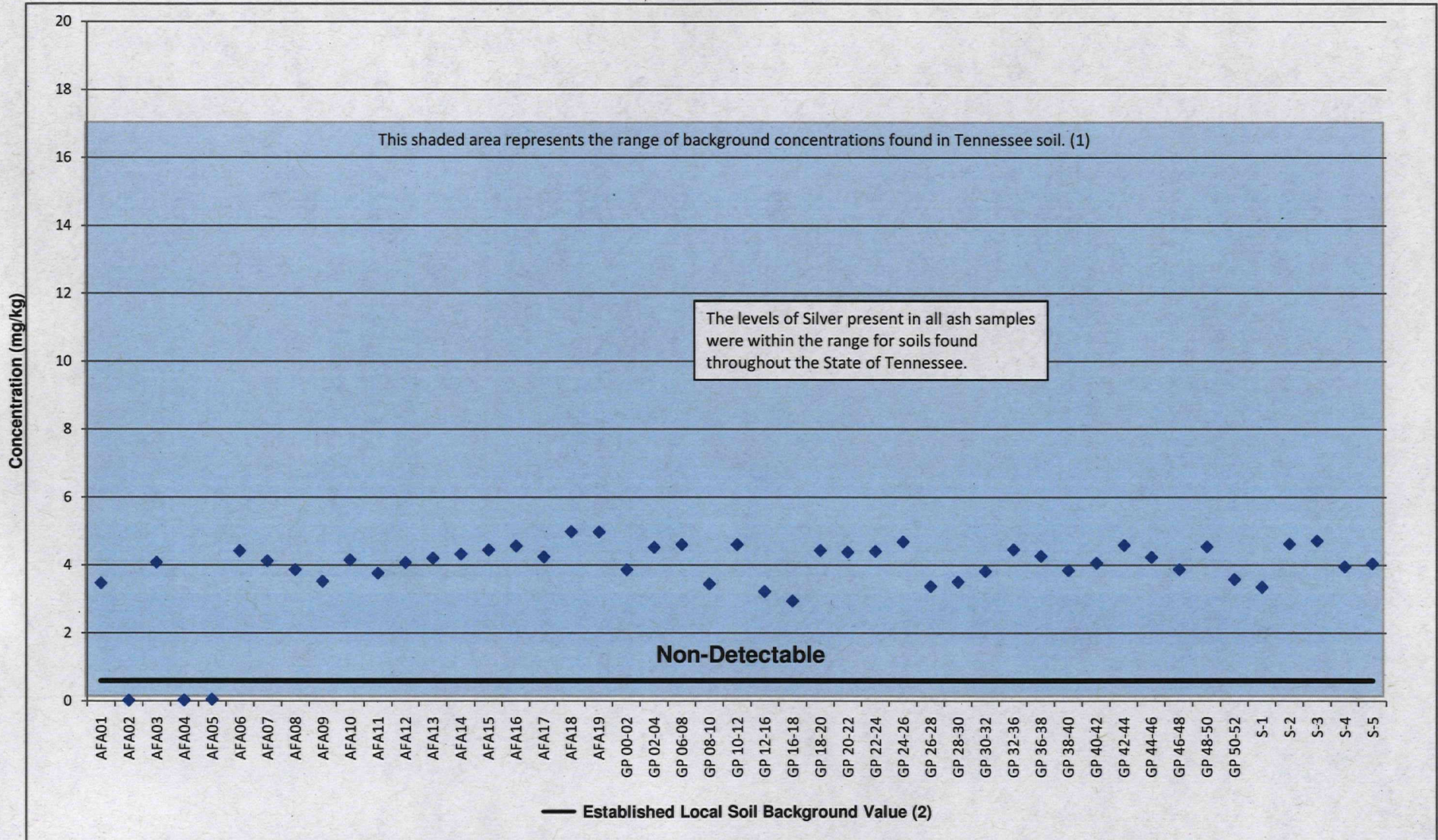


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - The Local Established Background Soil Value for Selenium is 1.47 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Silver, Total TVA Kingston Ash Spill

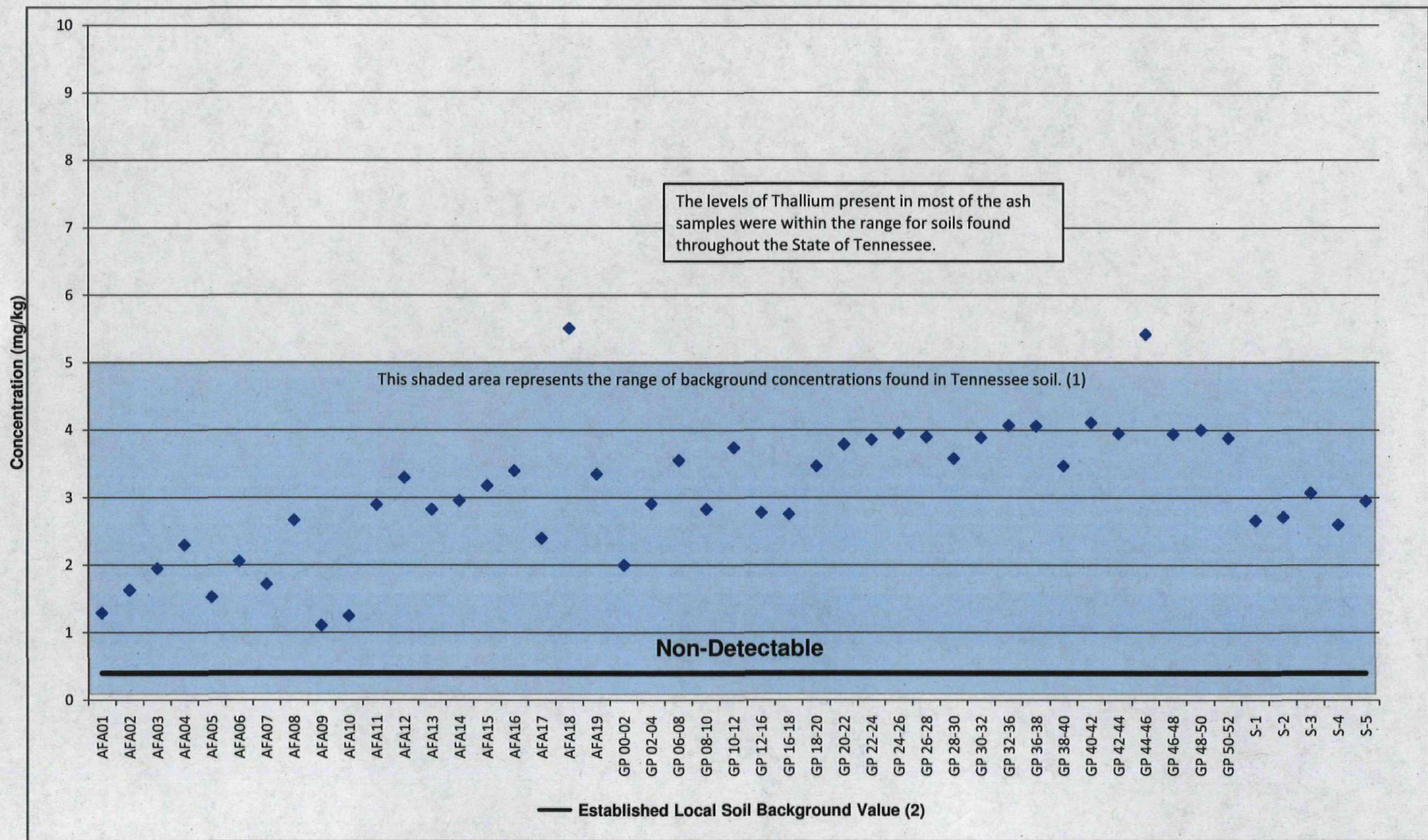


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - Silver was not detected in local soil at concentrations above the reporting limit of 0.6 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Thallium, Total TVA Kingston Ash Spill

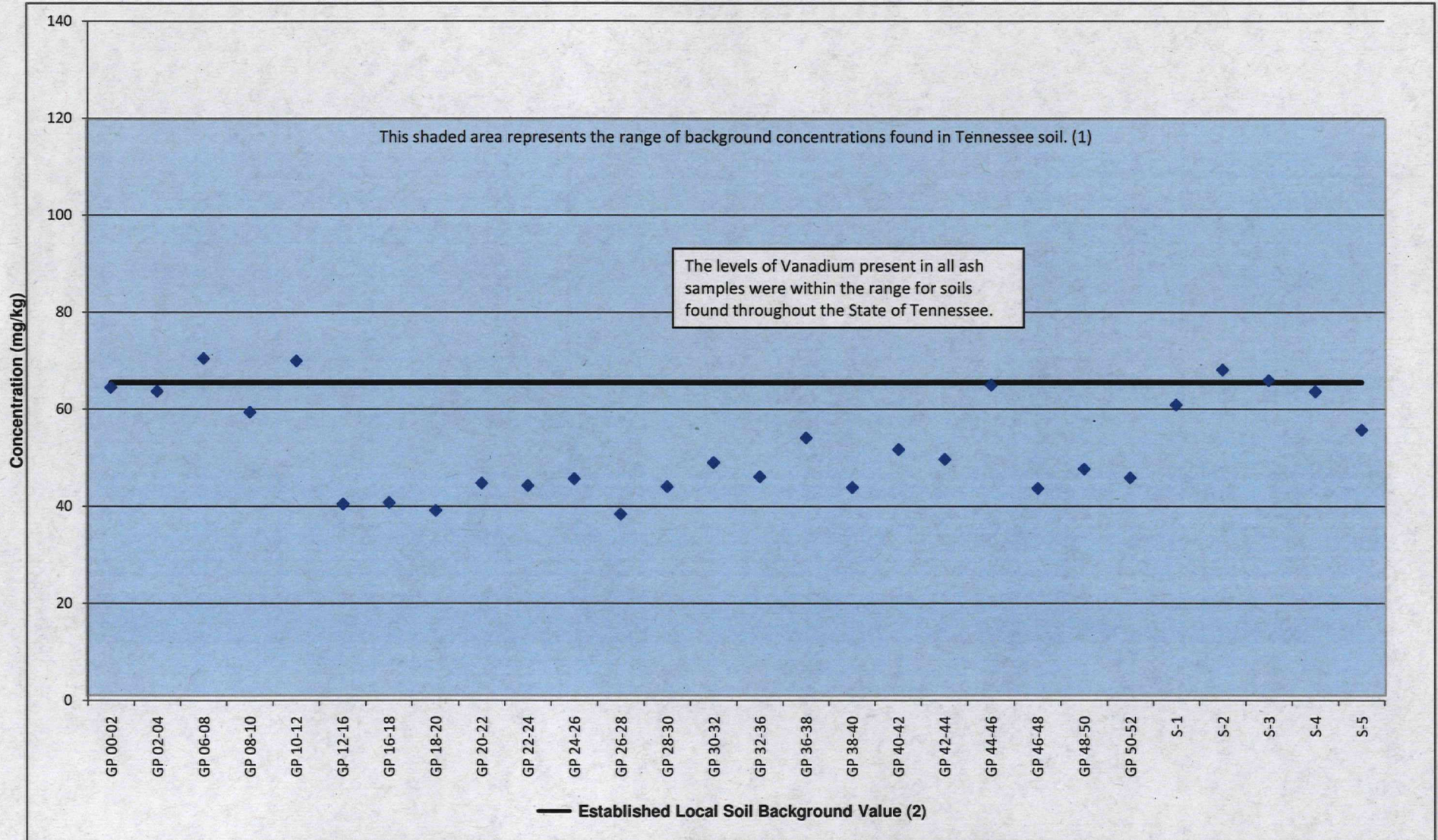


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - Thallium was not detected in local soil at concentrations above the reporting limit of 0.4 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Vanadium, Total TVA Kingston Ash Spill

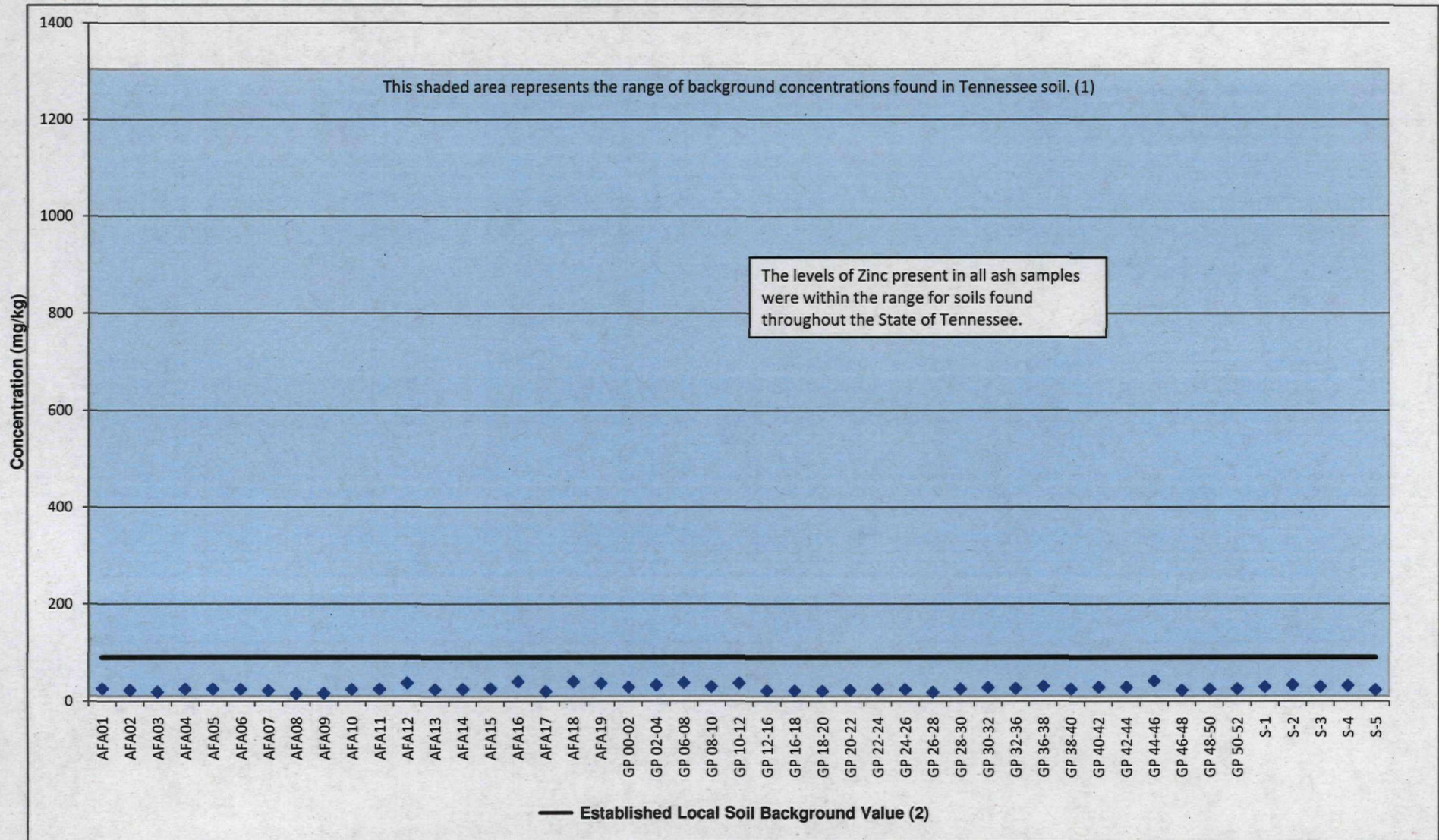


- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - The Local Established Background Soil Value for Vanadium is 65.47 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003

## Zinc, Total TVA Kingston Ash Spill



- Numbers following the GP locations label represent the depth (in feet) of the sample from the intact dredge cell.

(1) - Hazardous Trace Elements in Tennessee Soils and Other Regolith, TDEC, Division of Geology, 2001

(2) - The Local Established Background Soil Value for Zinc is 89.7 mg/kg. Soil Background Supplemental Data Set for the East Tennessee Technology Park, Oak Ridge, TN, Bechtel Jacobs Company LLC, 2003